a)(i) Galvanic cell.

(ii)

anode reaction

$Fe_{(s)} \longrightarrow Fe^{2+} + 2e^-$ 0.44 V

cathode reaction

$Cu^{2+} + 2e^- \longrightarrow Cu_{(s)}$ 0.34 V −

$Fe_{(s)} + Cu^{2+} \longrightarrow Fe^{2+} + Cu_{(s)}$ 0.10 V

0.1 V is needed

b) Galvani, with his 'apparent' discovery of (frog leg twitched when connected in circuit w/ electrodes and power source) 'animal electricity' which was discovered to instead be a galvanic cell, began further experimentation by other scientists, of electron movement through a circuit, containing 2 electrodes (oxidising or inert), an electrolyte and a power source.

These other Scientists, Davy and his young lab assistant Michael Faraday, extended on Galvani's findings, as mentioned.

Davy was the first to discover Electrolysis.

He discovered that the frog was ~~acting~~ 'finishing' the circuit, therefore e^- were able to circulate. After Davy's death, Faraday continued research, and was the one to name the 'electrolyte'. (The frog in Galvani's experiment was actually an electrolyte - 'finishing' the circuit). Faradays also came up with 2 Laws relating to his findings.

Faradays First Law.

The amount of product (or decomposed product) produced in ~~a cell~~ (electrolysis) ~~was~~ is directly proportional to the amount of electricity that is put through the cell.

~~These~~

Galvani, Davy and Faraday all contributed to the understanding of electrochemical cells and our understanding of electron transfer reactions

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Desalination.

c(i) ~~[illegible] desalination~~.

(ii) ~~[illegible]~~

The artifacts are gently ~~washed in~~ placed in a deionised water bath for a long period of time to get rid of excess salt and other fine particles that are on the surface.

~~[illegible]~~

~~[illegible] then be electrolysed to~~

Curators determine conditions - temp/pressure by which these artifacts will have a maximum life-span, and they are put in these conditions.

d (i) Using electrolysis.
with an acidic electrolyte (dilute HCl)
place the metal electrode at the
anode, and another metal electrode at
the cathode.
Observe the (rate of) ~~reaction~~ corrosion. at the
anode.
Repeat using a nuetral electrolyte (H_2O)

(ii) It ~~is~~ was observed that the electrolytic cell containing
the acidic electrolyte had a faster rate
of corrosion than the nuetral ~~ely~~ electrolyte
cell. This supports the hypothesis that
acidic environments accelerate the corrosion
of shipwrecks.
Acidic compounds act as a catalyst in
these reactions (corrosion). Therefore, the catalyst,
by decreasing the activation energy, increases
the reaction rate.
Also the more concentrated the (electrolyte) environment is,
the greater the corrosion/ reaction rate.
corrosion rate depends on concentration of
electrolyte, nature of electrolyte, nature of
electrodes.

e) corrosion of metallic objects is affected by temperature, amount of dissolved oxygen and pressure. The ocean has ~~undergoes~~ a mixture of high and low temperatures, high and low pressure and amounts of dissolved oxygen. These changes ~~ar~~ occur at different ocean depths.

The ocean is RELATIVELY warm, until ~~[illegible]~~ the depth whereby light in no longer penetrable. Below this ~~At this~~ depth temperatures are extremely low, which decreases rate of corrosion. & Higher temps therefore increase rate of corrosion.

Dissolved oxygen is more present at lower depths. The more dissolved oxygen there is the greater the rate of reaction.

High Pressure is found at greater ocean depths. High pressure promotes reactions (oxygen and metal reactions - corrosion) therefore the rate of reaction increases as pressure increases.

These three factors coincide to create an environment at great depths which enables fast corrosion of metallic objects